to 32 to 35°C (89.6 to 95°F). This last measure may accomplish the desired goal of normal body temperature when the initial measures have been unsuccessful. Wash and irrigation solutions (including those used in cytoscopy) should be at body temperature, and the duration of exposure of peritoneal or pleural surfaces should be minimized. The transportation of ill neonates is a complex subject, but at the least requires the prevention of heat loss with the use of a transport isolette and, if necessary, wrapping the child in commercial packing bubble wrap plastic.

Intraoperative fluid management requires an understanding of renal physiology in the infant who is an obligate salt-loser. An infant should receive nothing by mouth within four hours of operation; fluid deficit before operation should then be calculated and replaced with 5 percent dextrose in 0.2 percent saline, 50 percent in the first hour and 10 to 25 percent per hour thereafter. "Third space" losses require replacement, and lactated Ringer solution with 5 percent dextrose is the fluid of choice. Replacement of blood loss is based on both the volume of loss and the hematocrit. Blood should be replaced when loss reaches 10 percent of estimated blood volume or to prevent the hematocrit reading from falling below 30 percent. Before this point, lactated Ringer solution with or without albumin may be used. Interestingly, humidification of inspired gases notably reduces insensible loss, and fluid administration rates require adjustment accordingly.

The actual choice of anesthetic technique is of far less importance than meticulous attention to detail, a knowledge of drug dosages (in mg per kg of body weight) and careful monitoring with stethoscope, temperature probe, electrocardiograms and blood pressure cuff.

Measurement of blood pressure with a Doppler device is preferred and should be used with the knowledge that a systolic blood pressure below 60 mm of mercury in a term infant, or below 45 mm of mercury in a premature infant, is abnormal.

Attention to the special points outlined in this review allows an anesthesiologist to provide an extension of the intensive care unit for the optimum care of an ill child.

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Metocurine—A 'New' Muscle Relaxant

ANESTHESIOLOGISTS have long sought a muscle relaxant with pure neuromuscular blocking properties, but no cardiovascular side effects. Such an agent could provide greater than usual stability during anesthesia, especially in critically ill patients. Recent attempts to synthesize such an agent have not been fruitful. However, there has been a revival in the use of an older drug, metocurine iodide (formerly known as dimethyltubocurarine iodide), which appears to have greater safety than agents presently in use. Originally synthesized in the 1930's, and overshadowed by *d*-tubocurarine (DTC), metocurine has seen little clinical use until the past several years.

Metocurine is classified as a nondepolarizing relaxant. The doses for 50 percent and 95 percent relaxation are 0.13 and 0.28 mg per kg of body weight, respectively. A dose of 0.3 to 0.4 mg per kg of body weight (25 to 30 mg in an average adult) produces satisfactory conditions for tracheal intubation. At this dose, metocurine produces the same neuromuscular effects as pancuronium, 0.1 mg per kg of body weight, or DTC, 0.6 mg per kg of body weight. Onset time for an intubation dose is approximately four minutes. For the *same* amount of paralysis, its duration is similar to either pancuronium or DTC. For use in maintenance of relaxation of intubated patients, a dose approximately half that of DTC, or four times that of pancuronium is necessary (2 mg of DTC is approximately equal to 1 mg of metocurine, and 1 mg of pancuronium is approximately equal to 4 mg of metocurine). In the absence of renal failure, metocurine is readily antagonized by neostigmine or pyridostigmine. As with other relaxants, the use of a nerve stimulator will aid anesthesiologists in selecting the optimum dosage and evaluating recovery from neuromuscular blockade.

Cardiovascular effects are less pronounced than those after administration of DTC or pancuronium. In approximately a fourth of patients a decrease in arterial blood pressure will occur, and also erythema of the skin (possibly from histamine release), but these changes are less pronounced than those seen after DTC administration. Hypertension does not occur, in contrast to pancuronium; and tachycardia, when occurring, is much less prominent than that from either pancuronium or gallamine. All cardiovascular changes can be

lessened by slow administration of the drug (over one to three minutes).

Metocurine seems to be the agent of choice for use in critically ill patients in whom tachycardia and hypertension of pancuronium or gallamine are to be avoided, or in whom the pronounced hypotensive effects of DTC may be detrimental. For example, patients with coronary artery disease, arterial hypertension, aortic insufficiency, mitral stenosis, mitral insufficiency or vascular aneurysms would seem to be good candidates for its use. Perhaps someday a pure neuromuscular blocking agent, without any cardiovascular side effects, will be available. Until that time, metocurine appears to be the agent with the least cardiovascular side effects of available relaxants.

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Is Fentanyl a Wonder Drug?

FENTANYL, a short acting (20 to 30 minutes) narcotic, was introduced in the United States in 1968 in combination with droperidol as Innovar®. Later it became available as fentanyl citrate (Sublimaze®) and now it is increasingly being used with nitrous oxide or other drugs for balanced anesthesia. Fentanyl is 100 times more potent and 10^7 times more lipid soluble than morphine. Its onset is rapid (seconds) and the serum rapid phase half time is two to three minutes. Fat tissue concentrations such as in brain rapidly exceed serum levels, and this gradient probably contributes to the slower serum elimination phase (half time one to four hours depending on dose). Urinary excretion of unaltered fentanyl only amounts to 20 percent of the injected drug. It is a weak base with a dissociation constant (pKa) of 7.4 to 7.5 (in methanol), and is highly bound (70 percent) to serum proteins. These characteristics indicate a kinetic similarity to thiopental. Unlike thiopental, fentanyl is an excellent analgesic but does not have good hypnotic or amnestic properties.

It is a clinical impression that compared with morphine, fentanyl has more autonomic nervous stimulation (bradycardia, gastrointestinal effects) and it may produce skeletal muscle hypertonicity which is related to rapid intravenous injection. In healthy patients fentanyl is free of significant cardiovascular side effects, and unlike most narcotics, fentanyl does not produce general vasodilation, but rather mild vasconstriction probably related to catecholamine release. Fentanyl, therefore, is useful for analgesia and anesthesia in cardiac and critically ill patients.

The main problem with fentanyl, however, is that measurable respiratory depression persists much longer than clinical analgesia. Residual respiratory effects may be seen four to six hours after a single dose. This may be related to the total amount of the drug given since small amounts (1 to 5 ml) are usually reversed easily, but larger amounts (over 10 ml) either have a cumulative effect or have a different mechanism of depressing the respiratory centers. It has been observed that naloxone may not completely reverse the respiratory effects following large doses. This respiratory side effect should be a strong caution to the occasional or inexperienced user of this increasingly popular potent drug.

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Recent Advances in the Management of Head Injured Patients

OSMOTIC DIURETICS, induced respiratory alkalosis and corticosteroids are the principal aids for decreasing an increased intracranial pressure following head injury. Mannitol is the osmotic diuretic most frequently employed for decreasing intracranial pressure. It effects water removal from normal brain rather than edematous tissue, and is usually given intravenously in a dose of 1.0 to 1.5 grams per kg of body weight. It begins to reduce intracranial pressure within 15 minutes, and its decompressive effects last for four to six hours. Repeated administration of mannitol can result in a hyperosmolar state and cause central nervous system dysfunction. However, it has been shown that smaller doses of mannitol (0.25 to 0.5 grams per kg of body weight) given every